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ABSTRACT

Research indicates that students' learning performance can be improved through techniques of "action-feedback-correction," which involves the student answering questions, feedback on which answers are right and which wrong, and repetition of the process until the right answer is achieved. Such a system can easily be devised using objective practice exercises and standard answer sheets, on which incorrect answers are marked, but not corrected, before the sheets are returned to the student. Efforts should be made to ensure that students do not cheat; that they do not answer the questions until they have studied the assignment or read the material; and that the scoring, feedback, and correction parts of the process are carried out. Time can be saved through scoring the tests by machine, as opposed to by hand, although hand-scoring increases the link between student and instructor. Instructors can minimize the time spent in writing questions by focusing on the fundamentals section of the course, e.g., on key definitions, problem-solving techniques, and critical principles. The benefits of the action-feedback-correction technique include individualized instruction at low cost, a clear communication of learning objectives, improved student learning, and better monitoring of student progress. (HB)

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JC 820 404

HOW TO IMPROVE YOUR STUDENTS' LEARNING THROUGH PRACTICE EXERCISES AND FEEDBACK

by

Dan Hodges, Coordinator of Testing

Teachers often face the problem that their students do not study well enough. Students are often surprised by the questions on exams--despite their teachers' best efforts to explain the course objectives clearly. Many students get discouraged after they get low exam grades. They sometimes give up trying and drop out. Many resist learning the basic important concepts, facts, and principles; and they have trouble with later parts of their courses which build upon the fundamentals.

Fortunately, there are some effective applications of the ancient principle of action--feedback--correction which can help enormously. These new applications do take some work to get going initially, but they pay off in much higher student achievement. Best of all, this isn't just one more bright idea. There is solid proof in educational research that it works.

The General Principle

Here is the general principle involved.

A person's quality of performance tends to be high:

IF the person is doing an action and trying to reach a specific goal,

IF the person receives feedback which tells how close or how far he or she is from reaching the goal,

IF the person corrects his or her action, and

IF the person receives additional feedback which confirms that he or she is now doing it correctly.

This principle works for learning many skills: piano-playing, physical games, and vocational skills. As the person continues to practice and learns what's right and wrong, and as the person adjusts his or her behavior and finds out what works better, the person's skills grow and grow.

This principle also works when people try to learn concepts, principles, information, and problem-solving skills as in math or science. They read a lesson and then answer questions and problems based on the lesson. Then they learn which answers are right and which are wrong and go back and correct the errors and check again to see if, at last, they have the right answers. This strategy produces much superior learning to ordinary studying.

Many different researchers have contributed to the research that demonstrates the effectiveness of the action-feedback-correction principle in education. A relatively recent review of these studies can be found in Raymond W. Kulhavy, "Feedback in Written Instruction," Review of Educational Research, Winter 1977, v. 47, No. 1, pp. 211-232.

How can this principle be put to use with a practical system? How can a busy teacher have time to give meaningful assignments and provide feedback for many students for hundreds of questions every term? How can a teacher do it and not overload herself or himself with grading endless homework assignments? There is a way. Here is one such system.

A Practical System

1. Make up reusable booklets of objective practice exercises: multiple-choice, true-false and matching questions.

2. Instruct the students to answer the questions only after they study the material or hear a lecture, read an assignment, see a film, etc.

3. They put all their answers on answer sheets. (DATRONICS answer sheets with 50 questions per side cost 4¢ each. L.C.C. could print its own even more cheaply.)

4. You or an aide score the students' answer sheets by using an answer key with holes punched in it to find correct answers. You mark errors, but do not reveal the correct answers to the mistakes at this point. (Scoring goes extremely fast: 10 seconds or less to find and mark errors on a 50-question answer sheet.)

5. The student takes back the answer sheet, corrects the errors, and returns the answer sheet for re-scoring until all the items are correct.

Some Pitfalls to Avoid

DON'T let the students answer the questions until they have read the assignment or studied the material. If they guess on too many questions and use the feedback to figure out the answers for the first time, this method does not produce superior learning.

DON'T let the students "cheat" and see the answers before they make their choice. If they"cheat', this method's effectiveness drops way down. By the way, a common fault of commercially prepared student workbooks is that they permit students to peek at answers easily.

DON'T skip the scoring and the feedback. Students use the feedback to confirm they got answers right and to solidify their learning. And they use it to identify their mistakes and to trigger new learning to correct mistakes.

DON'T skip the requirement that students correct their errors and return to you for re-scoring and for confirmation that the answers are now correct. If the students do not correct their errors, their learning is less.

Here is a surprising research finding: It is NOT necessary that the students receive immediate feedback right after they finish working the questions. It works perfectly well for students to answer some questions one day and to bring them in the next day for scoring. They will learn just as much. Some research has even found that delayed feedback produces higher learning than immediate feedback!

Suggestions and Practical Advice

If hand-scoring bugs you, use DATRONICS answer sheets and have them scored by machine in the Testing Office, Room 227, Center Building.

However, if you are willing to hand-score the practice exercises, you have a beautiful built-in opportunity for personal contact with your students. At last, you will see the students you need to see, the students who would ordinarily never visit a teacher. You can ask them a question, give them encouragement, and correct a pattern of mistakes. So can an aide.

Students think that practice exercises are relatively easy--especially if they can avoid writing out the answers. So they're likely to do them.

You should explain to the students the reasons for this method. Ask them not to work on the questions until they've studied the material. Ask them not to copy their friends' answers. Explain that there's something about the way the brain works that requires they do it the regular way.

One of your problems as a teacher is finding time to write all the questions for your booklets. One way to solve it: Start with questions on the fundamentals in each section of your course, the material that other material builds upon. Start with the key definitions, rock-bottom information, critical principles, and important problem-solving techniques. If you write questions on that material first, you get maximum effect from your practice exercises. Later you can write more material. Make sure to tell the students to also study the material that you don't have questions on.

Include lots of questions that involve "recognition memory". That means if the textbook states a definition in certain words, you use the same words as the right-answer option to the question. Even though it's easy to answer, students learn well.

Repeat some questions on the same topic in different ways. That reinforces learning.

Repeat the same important material for several weeks in a row. That will help students retain their knowledge for a long period of time.

Include some of the questions (or similar ones) on your exams and use additional new material. You can use a lesser scoring weight for the familiar material than for the new material, if you wish.

Some Benefits to Expect

1. You get some of the benefits of individualized instruction without the costs of computers or prohibitively expensive consumable materials or a horrendous drain of your time in writing a total self-contained program.

2. The students can take their booklets home. They don't have to come to a computer. Therefore, more of them do their work.

3. There are no lines of students waiting to use a computer terminal. There is no delay due to broken machinery. There is no added difficulty in trying to create a computer program that will handle your questions.

4. The students save money by having reusable booklets. Your department could supply them and collect them after use, or the students could purchase them at the bookstore and resell them after use, if they are clean. It's ecologically efficient.

5. By writing questions on your practice exercises, you communicate clearly to the students what your teaching objectives are. The students can use their practice exercise results to check whether they are studying enough and studying in the right way.

6. Your students will feel less anxious about your real tests because they know what to expect, and they know they can succeed. Therefore, fewer students will drop out.

7. Your students will learn more, and you will give them higher grades. And due to their success, fewer of them will drop out.

8. You can monitor the progress of a class more closely by studying the pattern of errors that students make on the practice exercises. If problems crop up, you can reteach some of the difficult material.

9. If normally you do not use objective tests, you can still gain important benefits by using objective practice questions. You can help the students learn the fundamentals at least to the stage of accurately recognizing correct answers. That skill makes them more ready to work on your tests where they are required to produce correct answers and to reason with the fundamental ideas.

In conclusion, I think this method would work for many teachers. I know it's more work writing questions and scoring answers. But won't the work pay off in the benefit of greater student learning?

Naturally, this method will not be the best approach for all students nor the best for all types of classes. But if you don't use practice problems and yet you can still get students to learn effectively, I'll bet you've worked out some other way to get the students to act, to receive clear feedback and to correct their mistakes.

If you wish to explore these ideas further, why don't you give me a call at the Testing Office, extension 2324? I'll be glad to share the material I have on action-feedback-correction.

Finally, if you do try this method and get some results--good or bad--would you share them with me? It would be useful feedback and would help me correct any mistaken ideas about practice exercises that I might have.

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